REG-WR-000007-2013.001

USEPA Federal Minor NSR Program Registration on Indian Country
Steamboat Butte C1/C3 Tank Batteries
Marathon Oil Corporation

Prepared by :

MarathonOil

Marathon Oil Corporation
Rocky Mountain Operations
1501 Stampede Avenue
Cody, WY 82414

February 2013

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
FEDERAL MINOR NEW SOURCE REVIEW PROGRAM IN INDIAN COUNTRY
40 CFR 49.151

Registration for Existing Sources
(FORM REG)

Please submit information to following two entities:

Federal Minor NSR Permit Coordinator
U.S. EPA, Region 8
1595 Wynkoop Street, 8P-AR
Denver, CO 80202-1129
R8airpermitting@epa.gov

For more information, visit:
http://www.epa.gov/region08/air/permitting/tmnsr.html

The Tribal Environmental Contact for the specific reservation:

If you need assistance in identifying the appropriate Tribal Environmental Contact and address, please contact: R8airpermitting@epa.gov

A. GENERAL SOURCE INFORMATION

1. Company Name Marathon Oil Corporation	**2. Source Name** C1/C3 Batteries
3. Type of Operation Oil Production	**4. Portable Source?** Yes ☐ No ☑ **5. Temporary Source?** Yes ☐ No ☑
6. NAICS Code 211111	**7. SIC Code** 1311
8. Physical Address (home base for portable sources) 27 Maverick Springs Road Kinnear, WY 82516	

9. Reservation*	**10. County***	**11a. Latitude***	**11b. Longitude***
Wind River	Fremont	C1- 43.275445 C3- 43.284856	C1- -108.908331 C3- -108.908756
12a. Quarter-Quarter Section*	**12b. Section***	**12c. Township***	**12d. Range***
C1 - SW/4 C3 - NW/4	C1 - 32 C3 - 32	C1 - 4N C3 - 4N	C1 - 1W C3 - 1W

* Provide all locations of operation for portable sources

B. CONTACT INFORMATION

1. Owner Name Marathon Oil Corporation	Title
Mailing Address 1501 Stampede Avenue, Cody, WY 82414	
Email Address	
Telephone Number (307) 587-4961	Facsimile Number
2. Operator Name (if different from owner) Marathon Oil Corporation	Title
Mailing Address 1501 Stampede Avenue, Cody, WY 82414	
Email Address	
Telephone Number (307) 587-4961	Facsimile Number
3. Source Contact Jacob Parker	Title HES Professional
Mailing Address 27 Maverick Springs Road, Kinnear, WY 82516	
Email Address jacobparker@marathonoil.com	
Telephone Number (307) 856-6228 ext. 2237	Facsimile Number (307) 857-1299
4. Compliance Contact Jacob Parker	Title HES Professional
Mailing Address 27 Maverick Springs Road, Kinnear, WY 82516	
Email Address jacobparker@marathonoil.com	
Telephone Number (307) 856-6228 ext. 2237	Facsimile Number (307) 857-1299

C. ATTACHMENTS

<u>Include all of the following information as attachments to this form</u>

Narrative description of the operations

Identification and description of all emission units and air pollution generating activities (with the exception of the exempt emissions units and activities listed in §49.153(c)

Identification and description of any existing air pollution control equipment and compliance monitoring devices or activities

Type and amount of each fuel used

Type raw materials used

Production Rates

Operating Schedules

Any existing limitations on source operations affecting emissions or any work practice standards, where applicable, for all regulated NSR pollutants at your source.

Total allowable (potential to emit if there are no legally and practically enforceable restrictions) emissions from the air pollution source for the following air pollutants: particulate matter, PM_{10}, $PM_{2.5}$, sulfur oxides (SOx), nitrogen oxides (NOx), carbon monoxide (CO), volatile organic compound (VOC), lead (Pb) and lead compounds, fluorides (gaseous and particulate), sulfuric acid mist (H_2SO_4), hydrogen sulfide (H_2S), total reduced sulfur (TRS) and reduced sulfur compounds, including all calculations for the estimates.

Estimates of the total actual emissions from the air pollution source for the following air pollutants: particulate matter, PM_{10}, $PM_{2.5}$, sulfur oxides (SO_x), nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compound (VOC), lead (Pb) and lead compounds, fluorides (gaseous and particulate), sulfuric acid mist (H_2SO_4), hydrogen sulfide (H_2S), total reduced sulfur (TRS) and reduced sulfur compounds, including all calculations for the estimates.

Other

D. TABLE OF ESTIMATED EMISSIONS

The following estimates of the total emissions in tons/year for all pollutants contained in your worksheet stated above should be provided.

Pollutant	Total Actual Emissions (tpy)	Potential Emissions (TPY)
PM	0.00	0.00
PM_{10}	0.00	0.00
$PM_{2.5}$	0.00	0.00
SO_x	138.47	207.34
NO_x	2.50	5.26
CO	11.60	20.73
VOC	45.63	66.31
Pb	0.00	0.00
Fluorides	0.00	0.00
H_2SO_4	0.00	0.00
H_2S	9.48	13.07
TRS	0.00	0.00
RSC	0.00	0.00

PM - Particulate Matter
PM_{10} - Particulate Matter less than 10 microns in size
$PM_{2.5}$ - Particulate Matter less than 2.5 microns in size
SOx - Sulfur Oxides
NOx - Nitrogen Oxides
CO - Carbon Monoxide
VOC - Volatile Organic Compound
Pb - Lead and lead compounds
Fluorides - Gaseous and particulates
H_2SO_4 - Sulfuric Acid Mist
H_2S - Hydrogen Sulfide
TRS - Total Reduced Sulfur
RSC - Reduced Sulfur Compounds

Emissions calculations must include fugitive emissions if the source is one the following listed sources, pursuant to CAA Section 302(j):

(a) Coal cleaning plants (with thermal dryers);
(b) Kraft pulp mills;
(c) Portland cement plants;
(d) Primary zinc smelters;
(e) Iron and steel mills;
(f) Primary aluminum ore reduction plants;
(g) Primary copper smelters;
(h) Municipal incinerators capable of charging more than 250 tons of refuse per day;
(i) Hydrofluoric, sulfuric, or nitric acid plants;
(j) Petroleum refineries;
(k) Lime plants;
(l) Phosphate rock processing plants;
(m) Coke oven batteries;
(n) Sulfur recovery plants;
(o) Carbon black plants (furnace process);
(p) Primary lead smelters;
(q) Fuel conversion plants;
(r) Sintering plants;
(s) Secondary metal production plants;
(t) Chemical process plants
(u) Fossil-fuel boilers (or combination thereof) totaling more than 250 million British thermal units per hour heat input;
(v) Petroleum storage and transfer units with a total storage capacity exceeding 300,000 barrels;
(w) Taconite ore processing plants;
(x) Glass fiber processing plants;
(y) Charcoal production plants;
(z) Fossil fuel-fired steam electric plants of more that 250 million British thermal units per hour heat input, and
(aa) Any other stationary source category which, as of August 7, 1980, is being regulated under section 111 or 112 of the Act.

Instructions

Please answer all questions. If the item does not apply to the source and its operations write "n/a". If the answer is not known write "unknown".

A. General Source Information

1. Company Name: Provide the complete company name. For corporations, include divisions or subsidiary name, if any.

2. Source Name: Provide the source name. Please note that a source is a site, place, location, etc… that may contain one or more air pollution emitting units.

3. Type of Operation: Indicate the generally accepted name for the operation (i.e., asphalt plant, gas station, dry cleaner, sand & gravel mining, oil and gas well site, tank battery, etc.).

4. Portable Source: Does the source operate in more than one location? Some examples of portable sources include asphalt batch plants and concrete batch plants.

5. Temporary Source: A temporary source, in general, would have emissions that are expected last less than 2 years. Do you expect to cease operations within the next 2 years?

6. NAICS Code: North American Industry Classification System. The NAICS Code for your source can be found at the following link → North American Industry Classification System (http://www.census.gov/epcd/naics/nsic2ndx.htm#S1).

7. SIC Code: Standard Industrial Classification Code. Although the new North American Industry Classification System (NAICS) has replaced the SIC codes, much of the Clean Air Act permitting processes continue to use these codes. The SIC Code for your source can be found at the following link → Standard Industrial Classification Code (http://www.osha.gov/pls/imis/sic_manual.html).

8. Physical Address: Provide the actual address of where the source is operating, not the mailing address. Include the State and the ZIP Code.

9. Reservation: Provide the name of the Indian reservation within which the source is operating.

10. County: Provide the County within which the source is operating.

11a & 11b. Latitude & Longitude: These are GPS (global positioning system) coordinates. This information can be provided in decimal format or degree-minute-second format.

12a – 12d. Section-Township-Range: Please provide these coordinates in Quarter-Quarter Section/Section/Township/Range. (e.g., SW ¼, NE ¼ /S36/T10N/R21E).

B. Contact Information

Please provide the information requested in full.

1. Owners: List the full name (last, middle initial, first) of all owners of the source.

2. Operator: Provide the name of the operator of the source if it is different from the owner(s).

3. Source Contact: The source contact must be the local contact authorized to receive requests for data and information.

4. Compliance Contact: The compliance contact must be the local contact responsible for the source's compliance with this rule. If this is the same as the Source Contact please note this on the form.

C. Attachments

The information requested in the attachments will enable EPA to understand the type of source being registered and the nature and extent of the air pollutants being emitted.

D. Total Emissions

1. Allowable Emissions (See also, Potential to Emit): Emissions rate of a source calculated using the maximum rated capacity of the source (unless the source is subject to practically and legally enforceable limits which restrict the operating rate, or hours of operation, or both) and the most stringent of the following:

   a) Any applicable standards as set forth in 40 CFR parts 60 and 61;

   b) Any applicable Tribal or Federal Implementation Plan emissions limitation, including those with a future compliance date; or

   c) Any emissions rate specified as a federally enforceable permit condition, including those with a future compliance date.

2. Potential to Emit: The maximum capacity of a source to emit a pollutant under its physical and operational design. Any physical or operational limitation on the capacity of the source to emit a pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored, or processed, shall be treated as part of its design if the limitation or the effect it would have on emissions is enforceable as a practical matter. See Allowable Emissions.

3. Actual Emissions: Estimates of actual emissions must take into account equipment, operating conditions, and air pollution control measures. For a source that operated during the entire calendar year preceding the initial registration submittal, the reported actual emissions typically should be the annual emissions for the preceding calendar year, calculated using the actual operating hours, production rates, in-place control equipment, and types of materials processed, stored, or combusted during the preceding calendar year. However, if you believe that the actual emissions in the preceding calendar year are not representative of the emissions that your source

will actually emit in coming years, you may submit an estimate of projected actual emissions along with the actual emissions from the preceding calendar year and the rationale for the projected actual emissions. For a source that has not operated for an entire year, the actual emissions are the estimated annual emissions for the current calendar year.

4. The emission estimates can be based upon actual test data or, in the absence of such data, upon procedures acceptable to the Reviewing Authority. The following procedures are generally acceptable for estimating emissions from air pollution sources:

   (i) Source-specific emission tests;
   (ii) Mass balance calculations;
   (iii) Published, verifiable emission factors that are applicable to the source. (i.e., manufacturer specifications).
   (iv) Other engineering calculations; or
   (v) Other procedures to estimate emissions specifically approved by the Reviewing Authority.

5. Guidance for estimating emissions can be found at http://www.epa.gov/ttn/chief/efpac/index.html.

Attachments:
Section C

Marathon Oil

NARRATIVE DESCRIPTION OF OPERATIONS AND LOCATION

Marathon Oil

Facility Process Description

The Steamboat Butte C-3 and C-1 Tank Batteries treat and store a crude and water emulsion gathered from field wells constructed prior to 1970. The C1 and C3 facilities were grandfathered with respect to the to the Clean Air Act and have only recently become subject to permitting requirements under 40 CFR Part 71, Federal Operating Permit Programs when the facility sulfur dioxide emissions exceeded 100 tons per year major source permitting threshold. The Steamboat Butte operations are located on the Wind River Reservation located in Fremont County, Wyoming. The C-1 facility is located at Latitude 43° 16' 29.90" North, Longitude 108° 54' 31.42" West. The C-3 facility is located at Latitude 43° 17' 04.01" North, Longitude 108° 54' 31.30" West.

An emulsion consisting of crude and water is gathered from field wells and is transferred to the C-1 and C-3 tank battery facilities. The emulsion sent to C-3 is processed through a free water knockout vessel which gravimetrically separates water from the remainder of the emulsion. The produced water is sent to a small on-site water storage tank battery where it is accumulated for low pressure injection. Any water not injected into the low pressure system is transferred to the C-1 water tanks. The C-3 dewatered emulsion is fed via a pipeline to the C-1 battery manifold where it is combined with the field emulsion supplied to the C-1 facility. The combined C-1 field and C-3 dewatered emulsion is directed to the free water knockout vessels where water is gravimetrically separated from the emulsion. The produced water is then sent to the C-1 water storage tank battery where it is injected or discharged via a permitted NPDES. The dewatered emulsion is fed to a treater which further promotes the separation of water and crude oil. Produced oil is stored in the C-1 oil storage tank battery until transfer to the sales line. Vapors resulting from the treatment process are routed to the C-1 production flare. The vapors from the C-1 oil storage tank battery are directed to the facility tank flare. Vapors from both the C-1 and C-3 water storage tank batteries are vented to atmosphere.

Driving Directions and Facility Visitor Requirements

The Steamboat Butte field office is located at 27 Maverick Springs Road, Kinnear, WY 82516 and the office phone number is (307) 856-6228. Driving direction to the office from the Riverton are as follows:

> Travel approximately 25 miles west of Riverton on Highway 26. Turn right after mile marker 106 onto Diversion Dam Road. Travel about 1.5 miles to Maverick Springs Road. Turn right on the Maverick Springs Road and the Marathon office is located in the blue steel sided building on the left-hand side of the road.

All visitors are required to check in with operations personnel at the Steamboat Butte field office prior to visiting any of the facilities. Visitors must be accompanied by a Marathon employee while visiting the facilities. Visitors are required to wear standard safety equipment including an H_2S monitor, fire resistant clothing, steel toed shoes, safety glasses, hard hat, and hearing protection where designated. Marathon can supply an H_2S monitor to a visitor in the event that they do not have one readily available. Marathon also recommends that their basic safety orientation training be completed by all visitors prior to entering the facilities.

EQUIPMENT, DESCRIPTIONS, AND CALCULATIONS

Marathon Oil

Insignificant Activities

Insignificant activities and the C1 and C3 facilities include fugitive equipment leaks, pop and rupture tanks and a concrete tank.

Fugitive Equipment Leaks

A field piping component inventory was conducted in Spring 2011 by Marathon operators. The emission factors reported in 1995 Protocol for Equipment Leak Emission Estimate (EPA-453/R-95-017) Table 2-4: Oil and Gas Production Operations Average Emission Factors were applied to the resulting count. The emission estimate is summarized below:

Steamboat Butte C-3 Fugitive Emission Calculations

Service	Component	Current Count	Emission factor (lb/component/hr)	VOC Wt. (%)	VOC		CO_2		CH_4		CO_{2e}	
					(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
					Wt. % = 49.51		Wt. % = 12.67		Wt. % = 17.68			
Gas	Valves	13	0.00992	49.51	0.06	0.28	0.02	0.07	0.02	0.10	0.50	2.17
	Connectors	6	0.00044	49.51	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.04
	Flanges	29	0.00086	49.51	0.01	0.05	0.00	0.01	0.00	0.02	0.10	0.42
	Other	1	0.01940	49.51	0.01	0.04	0.00	0.01	0.00	0.02	0.07	0.33
	Open End	4	0.00441	49.51	0.01	0.04	0.00	0.01	0.00	0.01	0.07	0.30
	Pump Seals	0	0.00529	49.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
					Wt. % = 100.00		Wt. % = 0.00		Wt. % = 0.00			
Light Oil	Valves	0	0.00551	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Connectors	0	0.00046	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Flanges	0	0.00024	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Other	0	0.01653	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open End	0	0.00309	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Pump Seals	0	0.02866	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
					Wt. % = 100.00		Wt. % = 0.00		Wt. % = 0.00			
Heavy Oil	Valves	143	0.0000185	100.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
	Connectors	163	0.0000165	100.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
	Flanges	370	0.0000009	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Other	4	0.000071	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open End	2	0.000309	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Pump Seals	3	NA	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
					Wt. % = 10.00		Wt. % = 0.00		Wt. % = 0.00			
Produced Water	Valves	35	0.000216	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Connectors	46	0.000243	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Flanges	42	0.000006	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Other	2	0.030865	10.00	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.00
	Open End	2	0.000551	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Pump Seals	1	0.000053	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		866			**0.11**	**0.5**	**0.0**	**0.1**	**0.0**	**0.1**	**0.7**	**3.3**

*Factors from 1995 Protocol for Equipment Leak Emission Estimate (EPA-453/R-95-017) Table 2-4: Oil and Gas Production Operations Average Emission Factors

C-3 Fugitive HAP Emissions

Component	lb/yr	TPY
n-C_6	0.00	0.01
Benzene	0.00	0.00
Toluene	0.00	0.00
Ethyl Benzene	0.00	0.00
Xylene	0.00	0.00

Steamboat Butte C-1 Fugitive Emission Calculations

Service	Component	Current Count	Emission factor* (lb/component/hr)	VOC (lb/hr)	VOC (tpy)	CO_2 (lb/hr)	CO_2 (tpy)	CH_4 (lb/hr)	CH_4 (tpy)	CO_{2e} (lb/hr)	CO_{2e} (tpy)
				Wt. % = 49.51		Wt. % = 12.67		Wt. % = 17.68			
Gas	Valves	48	0.00992	0.24	1.03	0.06	0.26	0.08	0.37	1.83	8.01
	Connectors	191	0.00044	0.04	0.18	0.01	0.05	0.01	0.07	0.32	1.41
	Flanges	23	0.00086	0.01	0.04	0.00	0.01	0.00	0.02	0.08	0.33
	Other	0	0.01940	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open End	4	0.00441	0.01	0.04	0.00	0.01	0.00	0.01	0.07	0.30
	Pump Seals	0	0.00529	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Wt. % = 100.00		Wt. % = 0.00		Wt. % = 0.00			
Light Oil	Valves	0	0.00551	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Connectors	0	0.00046	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Flanges	0	0.00024	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Other	0	0.01653	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open End	0	0.00309	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Pump Seals	0	0.02866	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Wt. % = 100.00		Wt. % = 0.00		Wt. % = 0.00			
Heavy Oil	Valves	36	0.0000185	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Connectors	124	0.0000165	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
	Flanges	33	0.0000009	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Other	0	0.000071	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open End	3	0.000309	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Pump Seals	0	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Wt. % = 10.00		Wt. % = 0.00		Wt. % = 0.00			
Produced Water	Valves	260	0.000216	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00
	Connectors	518	0.000243	0.01	0.06	0.00	0.00	0.00	0.00	0.00	0.00
	Flanges	535	0.000006	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Other	15	0.030865	0.05	0.20	0.00	0.00	0.00	0.00	0.00	0.00
	Open End	23	0.000551	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
	Pump Seals	4	0.000053	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		1817		**0.37**	**1.6**	**0.1**	**0.3**	**0.1**	**0.5**	**2.3**	**10.1**

*Factors from 1995 Protocol for Equipment Leak Emission Estiamte (EPA-453/R-95-017) Table 2-4: Oil and Gas Production Operations Average Emission Factors

C-1 Fugitive HAP Emissions

Component	lb/yr	TPY
n-C_6	0.00	0.02
Benzene	0.00	0.00
Toluene	0.00	0.00
Ethyl Benzene	0.00	0.00
Xylene	0.00	0.00

Pop and Rupture Tanks

These tanks (two located at the C-1 battery and on located at the C-3 battery) are utilized as vessel pressure relief containment. T he pressure relief system for vessels located at these facilities direct the production stream (fluids and gas) to the pop and rupture tanks should the pressure of any of these vessels reach set pressure levels that approach the pressure rating of the subject vessel. This system directs the production to a safe location and prevents liquid releases. Pressure relief situations are upset type of occurrences that cannot be predicted and do not occur routinely. The pop and rupture tanks located at the C-1 facility also serve as liquid flare knockout. Volumes sent to the pop and rupture tanks are accounted for in the facility throughputs utilized for emission calculations.

Concrete Tank

One concrete tank at the C3 facility is used to store and mix petroleum contaminated soils and other production materials until approval is secured to utilize it for road mix application. The use of this tank is highly variable and infrequent. The petroleum species present in these soil mixtures are of high molecular weight with low vapor pressures, and as such emission potential from this tank should be insignificant.

Emissions Units SBC1B-305/306/307
C-1 Treaters 2, 4 and 5

C-1 Treaters 2, 4 and 5 Emissions Calculations

A new 2MMBtu/hr treater is being installed in addition to the two existing 1MMBtu/hr treaters at the C-1 facility. The new 2MMBtu/hr treater is equipped with two fire tubes each with a 1 MMBtu/hr burner. The new treater will use sweet gas for combustion and the two existing treaters will be switched from sour gas to sweet gas. Emissions are estimated utilizing emission factors taken from AP-42, Table 1.4-2 for NOx and CO. Emissions of VOC and HAP constituents are considered combusted at a 98 percent efficiency.

Basis (per individual unit)

Unit(s)	SBC1B-305, 306		
Type	<100 MMBTU/hr		
Hours of Operation		8760	hrs
Fuel Heat Content (LHV)		1300.31	BTU/SCF
Heat Input Rate		1.0	MMBtu/hr
Annual Heat Input		8760	MMBtu
Annual Fuel Consumption		6.7	MMscf

HAP,VOC, and CO2 emission factors calculated from material balance assuming 98% burner efficiency

Criteria Pollutant Emission Factors From AP-42 1.4.1 (Small Boilers), 1.4.2 and 1.4.3

SO_2 Emission Factor Calculated assuming 4ppm H_2S pipeline quality natural gas

N_2O Emission Factors From 40 CFR 98, Subpart C, Table C-1 & C-2

Greenhouse Global Warming Potential From 40 CFR 98, Subpart A, Table A-1

Emissions Estimate

Constituent	Emission Factors		Emissions	
	lb/MMscf	lb/MMBtu	lb/hr	tpy
NO_X	100.000	0.098	0.098	0.429
CO	84.000	0.082	0.082	0.361
VOC	387.247	0.298	0.298	1.304
SO_2	0.662	0.001	0.001	0.003
Benzene	0.495	0.0004	0.000	0.002
Toluene	1.556	0.001	0.001	0.005
Ethylbenzene	0.336	0.000	0.000	0.001
Xylenes	4.258	0.003	0.003	0.014
n-Hexane	5.047	0.004	0.004	0.017
Total HAP	---	0.009	0.000	0.000
CO_2	159043.677	122.3119	122.312	535.73
N_2O	2.2	0.0022	0.002	0.009
CH_4	697.9	0.5367	0.537	2.351
CO_{2e}	---	---	134.251	588.02

Steamboat Butte C-1 Treater Heater Emissions New Treater added 2012

Basis (per individual unit)

Unit(s)	SBC1B-307	
Type	<100 MMBTU/hr	
Hours of Operation	8760	hrs
Fuel Heat Content (LHV)	1300.31	BTU/SCF
Heat Input Rate	2.0	MMBtu/hr
Annual Heat Input	17520	MMBtu
Annual Fuel Consumption	13.5	MMscf

HAP,VOC, and CO2 emission factors calculated from material balance assuming 98% burner efficiency

Criteria Pollutant Emission Factors From AP-42 1.4.1 (Small Boilers), 1.4.2 and 1.4.3

SO_2 Emission Factor Calculated assuming 4ppm H_2S pipeline quality natural gas

N_2O Emission Factors From 40 CFR 98, Subpart C, Table C-1 & C-2

Greenhouse Global Warming Potential From 40 CFR 98, Subpart A, Table A-1

Emissions Estimate

Constituent	Emission Factors		Emissions	
	lb/MMscf	lb/MMBtu	lb/hr	tpy
NO_X	100.000	0.098	0.196	0.859
CO	84.000	0.082	0.165	0.721
VOC	387.247	0.298	0.596	2.609
SO_2	0.662	0.00065	0.001	0.006
Benzene	0.495	0.0004	0.001	0.003
Toluene	1.556	0.001	0.002	0.010
Ethylbenzene	0.336	0.000	0.001	0.002
Xylenes	4.258	0.003	0.007	0.029
n-Hexane	5.047	0.004	0.008	0.034
Total HAP	---	---	1.80E-02	0.079
CO_2	159043.677	122.3119	244.62	1071.45
N_2O	2.200	0.0022	0.00	0.019
CH_4	697.890	0.5367	1.07	4.702
CO_{2e}	---	---	268.50	1176.04

Emission Factors Based on Sweet Gas Combustion With 98% Efficiency

Sweet Gas Composition			
Component	**Mole %**	**Btu/scf**	**MW**
Nitrogen	2.410	0.0	28
CO2	0.110	0.0	44
Methane	82.440	1010.0	16.042
Ethane	3.270	1769.6	30.07
Propane	4.198	2518.7	44.1
i-Butane	1.202	3257.5	58.12
n-Butane	2.089	3265.3	58.12
i-Pentane	1.099	4002.5	72.15
n-Pentane	0.976	4011.5	72.15
Hexanes	0.983	4758.2	86.17
n-Heptane	0.803	5506.3	100.21
Benzene	0.012	3745.2	78.11
Toluene	0.032	4478.6	92.14
Ethylbenzene	0.006	5226.7	106.17
p-Xylene	0.076	5213.3	106.17
n-Octane	0.165	6253.1	114.23
n-Nonane	0.012	6997.6	128.2
n-Hexane	0.111	4758.2	86.17

VOC Emission Factor Calculation

$$\text{VOC EF } 0.298\frac{lb\ VOC}{MMBtu} = \frac{\left(11.754\frac{C_3{}^{+}moles}{100\ moles}\right)\left(62.380\frac{lb\ VOC}{lb\ mole}\right)\left(\frac{1000000scf}{MMscf}\right)}{\left(379\frac{scf}{lb\ mole}\right)\left(1300.3\frac{MMBtu}{MMscf}\right)}\left(1-\frac{98\%}{100}\right)$$

Benzene Emission Factor Calculation

$$\text{Benzene EF } 0.00038\frac{lb}{MMBtu} = \frac{\left(0.012\frac{moles}{100\ moles}\right)\left(78.11\frac{lb}{lb\ mole}\right)\left(\frac{1000000scf}{MMscf}\right)}{\left(379\frac{scf}{lb\ mole}\right)\left(1300.3\frac{MMBtu}{MMscf}\right)}\left(1-\frac{98\%}{100}\right)$$

Toluene Emission Factor Calculation

$$\text{Toluene EF } 0.0012\ \frac{lb}{MMBtu} = \frac{\left(0.032\frac{moles}{100\ moles}\right)\left(92.14\frac{lb}{lb\ mole}\right)\left(\frac{1000000scf}{MMscf}\right)}{\left(379\frac{scf}{lb\ mole}\right)\left(1300.3\frac{MMBtu}{MMscf}\right)}\left(1-\frac{98\%}{100}\right)$$

SO_2 Emission Factor Calculation

$$SO_2\text{ EF } 0.00065\ \frac{lb}{MMBtu} = \frac{\left(0.0004\frac{moles\ H_2S}{100\ moles}\right)\left(64\frac{lb}{lb\ mole}\right)\left(\frac{1000000scf}{MMscf}\right)\left(\frac{98\%}{100}\right)}{\left(379\frac{scf}{lb\ mole}\right)\left(1300.3\frac{MMBtu}{MMscf}\right)}$$

Xylene Emission Factor Calculation

$$\text{Xylene EF } 0.0033\ \frac{lb}{MMBtu} = \frac{\left(0.076\frac{moles}{100\ moles}\right)\left(106.17\frac{lb}{lb\ mole}\right)\left(\frac{1000000scf}{MMscf}\right)}{\left(379\frac{scf}{lb\ mole}\right)\left(1300.3\frac{MMBtu}{MMscf}\right)}\left(1-\frac{98\%}{100}\right)$$

n-Hexane Emission Factor Calculation

$$\text{nHexane EF } 0.004\ \frac{lb}{MMBtu} = \frac{\left(0.111\frac{moles}{100\ moles}\right)\left(86.17\frac{lb}{lb\ mole}\right)\left(\frac{1000000scf}{MMscf}\right)}{\left(379\frac{scf}{lb\ mole}\right)\left(1300.3\frac{MMBtu}{MMscf}\right)}\left(1-\frac{98\%}{100}\right)$$

Ethyl Benzene Emission Factor Calculation

$$\text{Ethylbenzene } 0.00026\ \frac{lb}{MMBtu} = \frac{\left(0.006\frac{moles}{100\ moles}\right)\left(106.17\frac{lb}{lb\ mole}\right)\left(\frac{1000000scf}{MMscf}\right)}{\left(379\frac{scf}{lb\ mole}\right)\left(1300.3\frac{MMBtu}{MMscf}\right)}\left(1-\frac{98\%}{100}\right)$$

CO_2 Emission Factor Calculation

$$CO_2\text{ EF } 122.3\ \frac{lb}{MMBtu} = \frac{\left(0.110\frac{molesCO_2}{100\ moles}+1.397\frac{moles\ C}{mole\ feed\ gas}*\frac{98\%}{100}\right)\left(44\frac{lb}{lb\ mole}\right)\left(\frac{1000000scf}{MMscf}\right)}{\left(379\frac{scf}{lb\ mole}\right)\left(1300.3\frac{MMBtu}{MMscf}\right)}$$

Methane Emission Factor Calculation

$$\text{Methane EF } 0.537\ \frac{lb}{MMBtu} = \frac{\left(82.44\frac{moles}{100\ moles}\right)\left(16\frac{lb}{lb\ mole}\right)\left(\frac{1000000scf}{MMscf}\right)}{\left(379\frac{scf}{lb\ mole}\right)\left(1300.3\frac{MMBtu}{MMscf}\right)}\left(1-\frac{98\%}{100}\right)$$

Emissions using emission factors for all Treaters

$$pollutant\ \frac{lb}{hour} = Ef_i\frac{lb}{MMBtu} * heat\ input\ rate\ \frac{MMBtu}{hr}$$

Emission Unit SBC1B-510
C-1 Production Flare

C-1 Production Flare

These new flare calculations reflect an increase in sour gas flow rate from 6250 scf/hr to 7656 scf/hr. The extra gas was being utilized by two 1MMBtu/hr treaters that no longer use the sour gas as fuel.

The C-1 Production Flare is a custom made device manufactured by Marathon and does not have published manufacturer's specifications. A destruction rate efficiency of 98% for BTEX and VOCs was utilized in the amended permit application since the flare meets the requirements of 40 CFR 60.18(b). NO_X and CO components are a direct result of hydrocarbon destruction by the flare and as such are not controlled by the unit. NO_X and CO emissions have been calculated with a flare gas sample and EPA AP-42 emission factors for Flare Operations (Table 13.5-1). Greenhouse gas emissions have been calculated by the methodologies set forth by 40 CFR 98, Subpart W flare emission calculation.

Steamboat Butte C-1 Production Flare Emissions

Component	lb/mole	Btu/scf	Carbon	Flare Feed (mol %)	CO_2 Combustion Volumes (scfh)
N_2	28	0	0	10.696	0.0
CO_2	44	0	1	10.063	770.4
H_2S	34	639	0	3.413	0.0
C_1	16	909	1	38.614	2897.0
C_2	30	1619	2	9.604	1441.0
C_3	44	2315	3	8.908	2005.0
i-C_4	58	3011	4	2.928	878.6
n-C_4	58	3011	4	5.296	1589.3
i-C_5	72	3707	5	3.215	1206.0
n-C_5	72	3707	5	2.232	837.4
C_6	86	4404	6	2.651	1193.2
C_7	100	5100	7	1.485	779.9
C_8	114	5796	8	0.353	211.6
C_9	128	6493	9	0.087	59.0
C_{10}	142	7190	10	0.000	0.0
C_{11}^+	156	8283	11	0.000	0.0
Benzene	78	3591	6	0.031	14.1
Toluene	92	4274	7	0.033	17.2
E-Benzene	106	4970	8	0.007	4.3
Xylenes	106	4956	8	0.088	52.6
n-C_6	86	4404	6	0.295	132.6
Total	34.941			100.000	14089.39

VOC MW (lb/mol)	62.656		
Flare DRE (%)			98.00
scfh			7656
Energy Rate MMBTU/hr			10.89
BTU/scf			1423
NOx Emission Factor		0.068	lb/MMBTU
CO Emission Factor		0.37	lb/MMBTU

Flare emission factors obtained from AP 42 Table 13.5-1 Emission Factors for Flare Operations

Steamboat Butte C-1 Production Flare Emissions

Criteria Pollutant Emissions

NO_X	(lb/hr)	0.74
	(tpy)	3.24
CO	(lb/hr)	4.03
	(tpy)	17.65
VOC	(lb/hr)	6.99
	(tpy)	30.61
SO_2	(lb/hr)	43.24
	(tpy)	189.40

Heat of Combustion

$$\text{Heat of Combustion } \frac{Btu}{scf} = \left(\sum_i \left(\mathrm{C_i}\ \frac{mol\ \%}{100}\right)\left(H_i\ \frac{Btu}{scf}\right)\right) = 1{,}423\frac{Btu}{scf}$$

NO_X Emission Rate (AP42, Table 13.5-1)

$$NO_X \text{ Emission Rate } \frac{lb}{hr} = \frac{\left(0.068\frac{lb}{MMBtu}\right)\left(1{,}423\frac{Btu}{scf}\right)\left(7{,}656\frac{scf}{hr}\right)}{\left(10^6\ \frac{Btu}{MMBtu}\right)} = 0.74\ \frac{lb}{hr}$$

CO Emission Rate (AP42, Table 13.5-1)

$$\text{CO Emission Rate } \frac{lb}{hr} = \frac{\left(0.37\frac{lb}{MMBtu}\right)\left(1{,}423\frac{Btu}{scf}\right)\left(7{,}656\frac{scf}{hr}\right)}{\left(10^6\ \frac{Btu}{MMBtu}\right)} = 4.03\ \frac{lb}{hr}$$

VOC Emission Rate

$$\text{VOC Emission Rate } \frac{lb}{hr} = \frac{\left(7{,}656\frac{scf}{hr}\right)\left(27.61\frac{moles\ VOC}{100\ moles}\right)\left(62.565\frac{lb\ VOC}{mole\ VOC}\right)}{\left(379\frac{scf}{mole}\right)}\left(1-\frac{98\%}{100}\right) = 6.99\ \frac{lb}{hr}$$

SO_2 Emission Rate

$$SO_2 \text{ Emission Rate } \frac{lb}{hr} = \frac{\left(7{,}656\frac{scf}{hr}\right)\left(3.413\frac{moles\ H_2S}{100\ moles}\right)\left(1\frac{mole\ SO_2}{mole\ H_sS}\right)\left(64\frac{lb\ SO_2}{mole\ SO_2}\right)\left(\frac{98\%}{100}\right)}{\left(379\frac{scf}{mole}\right)} = 43.24\ \frac{lb}{hr}$$

HAP Pollutant Emissions

Total HAP	(lb/hr)	0.17
	(tpy)	0.72
Benzene	(lb/hr)	0.01
	(tpy)	0.04
Toluene	(lb/hr)	0.01
	(tpy)	0.05
E-Benzene	(lb/hr)	0.00
	(tpy)	0.01
Xylenes	(lb/hr)	0.04
	(tpy)	0.16
n-Hexane	(lb/hr)	0.10
	(tpy)	0.45

n-C_6 Emission Rate

$$\text{nC}_6 \text{ Emission Rate } \frac{lb}{hr} = \frac{\left(7{,}656\frac{scf}{hr}\right)\left(0.295\frac{moles}{100\ moles}\right)\left(86\frac{lb}{mole}\right)}{\left(379\frac{scf}{mole}\right)}\left(1-\frac{98\%}{100}\right) = 0.10\ \frac{lb}{hr}$$

Benzene Emission Rate

$$\text{Benzene Emission Rate } \frac{lb}{hr} = \frac{\left(7{,}656\frac{scf}{hr}\right)\left(0.031\frac{moles}{100\ moles}\right)\left(78\frac{lb}{mole}\right)}{\left(379\frac{scf}{mole}\right)}\left(1-\frac{95\%}{100}\right) = 0.01\ \frac{lb}{hr}$$

Toluene Emission Rate

$$\text{Toluene Emission Rate } \frac{lb}{hr} = \frac{\left(7{,}656\frac{scf}{hr}\right)\left(0.033\frac{moles}{100\ moles}\right)\left(92\frac{lb}{mole}\right)}{\left(379\frac{scf}{mole}\right)}\left(1-\frac{98\%}{100}\right) = 0.01\ \frac{lb}{hr}$$

Ethyl Benzene Emission Rate

$$\text{Ethyl Benzene Emission Rate } \frac{lb}{hr} = \frac{\left(7{,}656\frac{scf}{hr}\right)\left(0.007\frac{moles}{100\ moles}\right)\left(106\frac{lb}{mole}\right)}{\left(379\frac{scf}{mole}\right)}\left(1-\frac{98\%}{100}\right) = 0.003\frac{lb}{hr}$$

Xylene Emission Rate

$$\text{Xylene Emission Rate } \frac{lb}{hr} = \frac{\left(7{,}656\frac{scf}{hr}\right)\left(0.088\frac{moles}{100\ moles}\right)\left(106\frac{lb}{mole}\right)}{\left(379\frac{scf}{mole}\right)}\left(1-\frac{98\%}{100}\right) = 0.04\ \frac{lb}{hr}$$

Greenhouse Gas Pollutant Emissions		
CO_2 Uncombusted	(lb/hr)	89.44
	(tpy)	391.75
CH_4 Uncombusted	(lb/hr)	2.50
	(tpy)	10.93
CO_2 Combusted	(lb/hr)	1546.27
	(tpy)	6772.65
N_2O	(lb/hr)	0.002
	(tpy)	0.011
CO_{2e} Emissions	(lb/hr)	1688.87
	(tpy)	7397.23

Uncombusted CO_2

$$\text{Uncombusted CO}_2\text{ Emission Rate }\frac{lb}{hr} = \frac{\left(7{,}656\frac{scf}{hr}\right)\left(10.06\frac{moles}{100\ moles}\right)\left(44\frac{lb\ CO_2}{mole}\right)}{\left(379\frac{scf}{mole}\right)} = 89.44\ \frac{lb}{hr}$$

Uncombusted CH_4

$$\text{Uncombusted CH}_4\text{ Emission Rate }\frac{lb}{hr} = \frac{\left(7{,}656\frac{scf}{hr}\right)\left(38.61\frac{moles}{100\ moles}\right)\left(16\frac{lb\ CH_4}{mole}\right)\left(1-\frac{98\%}{100}\right)}{\left(379\frac{scf}{mole}\right)} = 2.5\ \frac{lb}{hr}$$

Combusted CO_2

$$\begin{matrix}\text{Combusted CO}_2\\ \text{Emission Rate}\end{matrix} = \frac{\left[\sum_i(CarbonCount_i)\left(C_i\frac{mole}{100\ moles}\right)\right]\left(7{,}656\frac{scf}{hr}\right)\left(44\frac{lb\ CO_2}{mole}\right)\left(\frac{98\%}{100}\right)}{\left(379\frac{scf}{mole}\right)} = 1{,}546.27\frac{lb}{hr}$$

N_2O

$$\begin{matrix}N_2O\\ \text{Emission Rate}\end{matrix} = \frac{\left(0.0001\frac{Kg\ N_2O}{MMBtu}\right)\left(1000\frac{g}{kg}\right)\left(7{,}656\frac{scf}{hr}\right)\left(\frac{1423\ Btu}{scf}\right)}{\left(454\frac{g}{lb}\right)\left(1000000\frac{Btu}{MMBtu}\right)} = 0.002\frac{lb}{hr}$$

CO_{2e}

$$Emission\ Rate = \left(89.44\frac{lb}{hr} + 1{,}546.27\frac{lb}{hr}\right) + \left(2.5\frac{lb}{hr}\right)(21GWP) + \left(0.002\frac{lb}{hr}\right)(310GWP) = 1{,}688.87\frac{lb}{hr}$$

Emission Unit SBC3B-320
C-3 Concrete Tank

C-3 Concrete Tank Emissions

Emission unit SBC3B-320 is a concrete tank open to the atmosphere that stores fluid brought to the surface during well workover and completion activities. The use of the tank is highly variable but is estimated at a weekly throughput of 400 barrels. The liquids stored in the tank are mostly water with an estimated composition of one mole percent oil. Oil that comes to the surface of the tank is skimmed and added to the battery. Emissions from the tank were estimated using Water9 V3. The Water9 emission model does not account for recovery from skimming the tank, so the estimates are highly conservative. The concrete tank composition was estimated using the method outlined below.

Oil Composition- The oil analysis for C-1 only reports constituents through C10+. The C10+ fraction represents 75.96 mole% and 88.12 weight % of the oil sample. A Gaussian distribution was used to speciate the C10+ constituents in an effort to more accurately represent the C10+ fraction volatility of the oil.

The average molecular weight of the C1-Battery oil sample is 217.8, while the average molecular weight of the C10+ fraction is 252.67. The average molecular weight for C10+ falls between that of C17 and C18, and as such, the mean value for the Gaussian distribution based on carbon number was chosen to be between C17 and C18 constituents.

$$Mole\ \% = \frac{1}{V * \sqrt{2 * pi}} * e^{\left(-\left(\frac{1}{2}\right)*\left(\frac{x-u}{V}\right)^2\right)} * Factor + Y\ shift$$

Where V is the Standard Deviation, u is the mean, x is the number of carbons in the hydrocarbon, Factor is used to increase the area under the curve from one to the C10+ Mole percent and Y shift is used to elevate the range from a base value of zero.

Table 1 Distribution Equation Values

Equation Parameters	
Standard Deviation (V)	2.2
Mean(u)	17.22
Factor	36.2
Y shift	2.208

The Factor, Standard Deviation and Y shift values were manipulated incrementally so that the representative composition matched the average molecular weight, Mole % of C10+ species and average molecular weight of C10+ constituents of those reported by the oil sample analysis.

Table 2 Oil composition

Marathon - C-1 Battery #2 Treater Pressurized Crude oil 11/4/2011 By AMERICAN MOBILE RESEARCH, Inc.	
Sample MW	**217.82**
Estimated MW	217.86
Sample C10+	**75.96**
Estimated C10+	75.94
Sample MW C10+	**252.68**
Estimated Average MW C10+	252.71

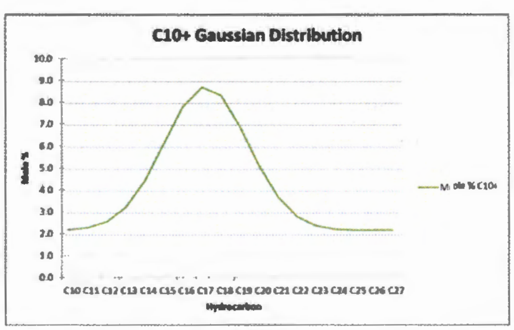

Figure 1 C10+ estimated distribution

The resulting distribution of the C10+ fraction is provided below in the oil composition columns. The final concrete tanks composition columns show the values that were entered into the Water9 simulation.

Table 3 Water9 input/output

Species	Water Composition		Oil Composition		Final Concrete Tanks Composition*		Water9 Estimated Emissions	
	mole %	PPM	mole %	PPM	mole %	PPM	Mg/yr	tpy
Water	99.000	990000.000	0.000	0.00	99.000	990000.000		0.000
Hydrogen Sulfide	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000
Carbon Dioxide	0.000	0.000	0.039	390.00	0.000	3.900	**0.014**	0.015
Nitrogen	0.000	0.000	0.002	20.00	0.000	0.200		–
Methane	0.000	0.000	0.166	1660.00	0.002	16.600	0.055	0.060
Ethane	0.000	0.000	0.093	930.00	0.001	9.300	0.031	0.034
Propane	0.000	0.000	0.260	2600.00	0.003	26.000	0.086	0.095
Isobutane	0.000	0.000	0.159	1590.00	0.002	15.900	0.053	0.058
Butane	0.000	0.000	0.438	4380.00	0.004	43.800	0.145	0.160
Isopentane	0.000	0.000	0.511	5110.00	0.005	51.100	0.169	0.186
Pentane	0.000	0.000	0.564	5640.00	0.006	56.400	0.187	0.206
Hexane	0.000	0.000	0.794	7940.00	0.008	79.400	**0.525**	0.578
Heptane	0.000	0.000	4.119	41190.00	0.041	411.900	1.360	1.496
Octane	0.000	0.000	9.365	93650.00	0.094	936.500	3.100	3.410
Nonane	0.000	0.000	5.777	57772.00	0.058	577.720	1.000	1.100
Decane	0.000	0.000	2.238	22380.92	0.022	223.809	0.169	0.186
Benzene	0.000	0.000	0.130	1300.00	0.001	13.000	0.043	0.047
Toluene	0.000	0.000	0.291	2910.00	0.003	29.100	0.096	0.106
Ethylbenzene	0.000	0.000	0.123	1230.00	0.001	12.300	0.041	0.045
p-Xylene	0.000	0.000	0.299	2990.00	0.003	29.900	**0.105**	0.116
o-Xylene	0.000	0.000	0.071	710.00	0.001	7.100		–
m-Xylene	0.000	0.000	0.048	480.00	0.000	4.800		–
2,2,4-Trimethylpentane	0.000	0.000	0.104	1040.00	0.001	10.400	0.034	0.038
2-Methylpentane	0.000	0.000	0.568	5680.00	0.006	56.800		–
3-Methylpentane	0.000	0.000	0.226	2260.00	0.002	22.600		–
Undecane	0.000	0.000	2.329	23286.25	0.023	232.862	0.064	0.071
dodecane	0.000	0.000	2.601	26012.72	0.026	260.127	0.021	0.023
Tridecane	0.000	0.000	3.251	32508.45	0.033	325.084	0.010	0.011
Tetradecane	0.000	0.000	4.457	44571.39	0.045	445.714	0.003	0.003
Pentadecane	0.000	0.000	6.153	61533.24	0.062	615.332	0.001	0.001
Hexadecane	0.000	0.000	7.837	78368.37	0.078	783.684	0.000	0.000
Heptadecane	0.000	0.000	8.740	87396.74	0.087	873.967	0.000	0.000
Octadecane	0.000	0.000	8.373	83725.31	0.084	837.253	0.000	0.000
Nonadecane	0.000	0.000	6.940	69400.06	0.069	694.001	0.000	0.000
Eicoscanes+	0.000	0.000	23.020	230200.000	0.230	2302.000	0.000	0.000

*Tank contents estimated to be 98.9% water and 1.1% oil by volume

Air emissions are based on a throughput of .10486 liter per second flow rate through an oil film unit

-- indicates species were not available for Water9 inputs so amounts were added to counterparts in same colored blocks bolded species received mole% of missing species

Emissions- The summary of emissions from the Water9 simulation is in table 3 under the water9 estimated emissions column and in table 4 below.

Table 4 Water9 emission summary

Emission Summary E-5 Water Tanks

Species	lb/hr	tpy
VOCs	1.811	7.934
n-Hexane	0.132	0.578
Benzene	0.011	0.047
Toluene	0.024	0.106
Ethylbenzene	0.010	0.045
Xylene	0.026	0.116
SO_2	0.000	0.000
CO_2	0.003	0.015
CH_4	0.014	0.060
CO_2e	0.293	1.283
H_2S	0.000	0.000
HAPs	0.212	0.929

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EXTENDED HYDROCARBON (GLYCALC) LIQUID STUDY
CERTIFICATE OF ANALYSIS

Company .... Marathon
Lab Number CR-11584
Date Sampled 10-13-2011
Study Number CR-7
Date Tested 11-4-2011

Sample Identification .... MARATHON - C-1 BATTERY #2 TREATER PRESSURIZED CRUDE OIL

Sample Location .... WYOMING.
Sample Pressure .... 18 PSIG
Type Sample .... SPOT
Test Method .... GPA 2186
Sample Temperature ..... 138 F
County .... FREMONT
Sampling Method GPA-2174

Components	Mole %	Weight %	Liq. Vol. %
Hydrogen Sulfide	0.000	0.000	0.000
Oxygen	0.000	0.000	0.000
Carbon Dioxide	0.039	0.008	0.008
Nitrogen	0.002	0.000	0.000
Methane	0.166	0.012	0.034
Ethane	0.093	0.013	0.030
Propane	0.260	0.053	0.086
iso-Butane	0.159	0.042	0.063
n-Butane	0.438	0.117	0.166
iso-Pentane	0.511	0.169	0.225
n-Pentane	0.564	0.187	0.246
Hexanes	0.794	0.314	0.393
Heptanes	4.119	1.895	2.290
Octanes	9.365	4.911	5.782
Nonanes	5.772	3.399	3.914
Decanes+	75.962	88.119	85.941
Benzene.....................	0.130	0.047	0.044
Toluene......................	0.291	0.123	0.117
Ethylbenzene..............	0.123	0.060	0.057
Xylenes......................	0.418	0.204	0.196
n-Hexane	0.690	0.273	0.342
2,2,4-Trimethylpentane..	0.104	0.055	0.065
Totals........................	100.000	100.000	100.000

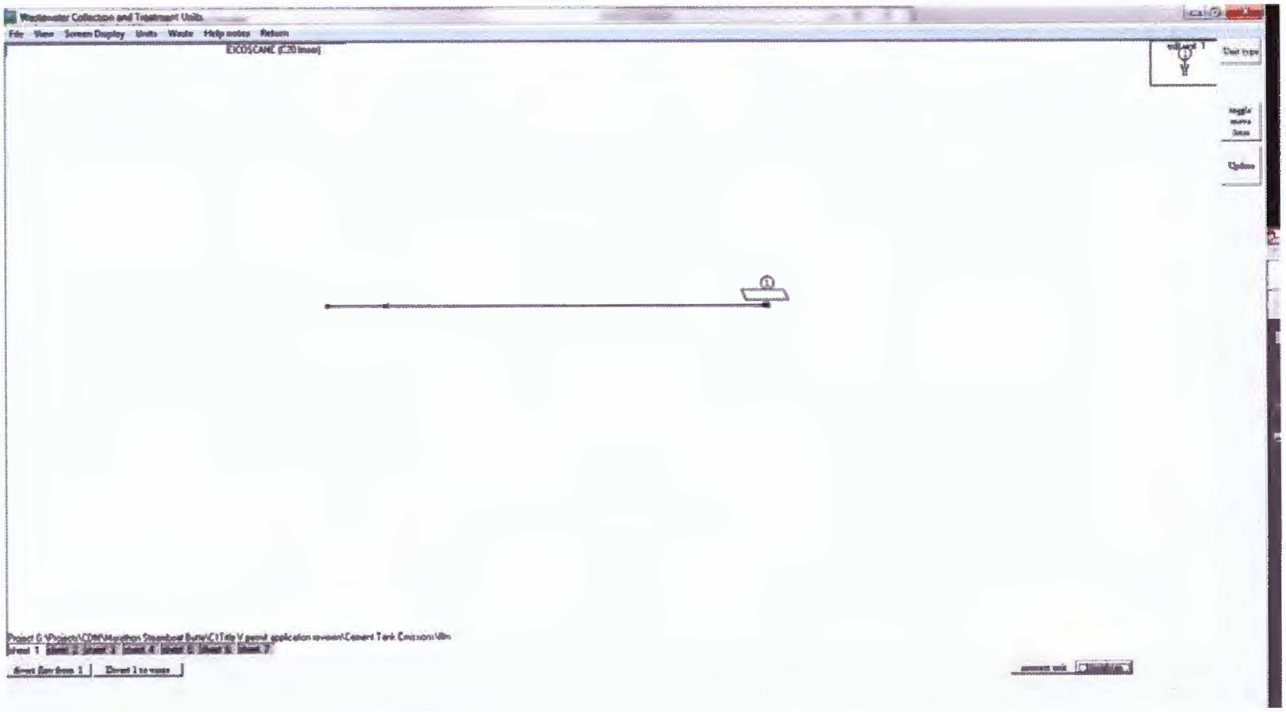
ADDITIONAL BETX DATA

Components	Mole %	Weight %	Liq. Vol. %
2-Methylpentane	0.568	0.225	0.281
3-Methylpentane	0.226	0.090	0.112
n-Hexane	0.690	0.273	0.342
2,2,4-Trimethylpentane	0.104	0.055	0.065
Benzene	0.130	0.047	0.044
Toluene	0.291	0.123	0.117
Ethylbenzene	0.123	0.060	0.057
m-Xylene	0.048	0.023	0.023
p-Xylene	0.299	0.146	0.140
o-Xylene	0.071	0.035	0.033

API GRAVITY AT 60/60 F, calculated	38.6
SPECIFIC GRAVITY AT 60/60 F, calculated	0.83177
RELATIVE SPECIFIC GRAVITY OF DECANES+ (C10+) FRACTION, calculated	0.85285
AVERAGE MOLECULAR WEIGHT	217.817
AVERAGE MOLECULAR WEIGHT OF DECANES+ (C10+) FRACTION, calculated	252.676
TRUE VAPOR PRESSURE AT 100 F, PSIA, calculated	10.326
AVERAGE BOILING POINT, F, calculated	469.080
CUBIC FEET OF GAS / GALLON OF LIQUID, as Ideal Gas, calculated	16.942
BTU / GALLON OF LIQUID AT 14.73 PSIA, calculated	126,010.00
LBS / GALLON OF LIQUID, calculated	6.935

NOTATION: ALL CALCULATIONS PERFORMED USING PHYSICAL CONSTANTS FROM GPA 2145-09, THE TABLES OF PHYSICAL CONSTANTS FOR HYDROCARBONS AND OTHER COMPOUNDS OF INTEREST TO THE NATURAL GAS INDUSTRY.

James A. Kane, President
American Mobile Research, Inc.



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WASTEWATER TREATMENT SUMMARY I 09-14-2012 11:14:16

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COMPOUND	RATE (g/s)	Fraction Air	Removal	Exit	Adsorb	error	emissions
BENZENE	1.36E-03	1.	.	.	0.0000	0.0000	(4.30E-02 Mg/yr)
BUTANE	4.59E-03	1.	.	.	0.0000	0.0000	(1.45E-01 Mg/yr)
ETHANE	9.75E-04	1.	.	.	0.0000	0.0000	(3.08E-02 Mg/yr)
ETHYLBENZENE	1.29E-03	1.	.	.	0.0000	0.0000	(4.07E-02 Mg/yr)
HEPTANE(-n)	4.32E-02	1.	.	.	0.0000	0.0000	(1.36E+00 Mg/yr)
HEXADECANE N	0.00E+00	.	.	1.	0.0000	0.0000	(0.00E+00 Mg/yr)
HEXANE(-n)	1.67E-02	1.	.	.	0.0000	0.0000	(5.25E-01 Mg/yr)
HYDROGEN SULFIDE	1.05E-24	1.	.	.	0.0000	0.0000	(3.31E-23 Mg/yr)
METHANE	1.74E-03	1.	.	.	0.0000	0.0000	(5.49E-02 Mg/yr)
OCTANE	9.82E-02	1.	.	.	0.0000	0.0000	(3.10E+00 Mg/yr)
PENTANE	5.91E-03	1.	.	.	0.0000	0.0000	(1.87E-01 Mg/yr)
PROPANE	2.73E-03	1.	.	.	0.0000	0.0000	(8.60E-02 Mg/yr)
TOLUENE	3.05E-03	1.	.	.	0.0000	0.0000	(9.62E-02 Mg/yr)
TRIMETHYLPENTANE 2,2,4	1.09E-03	1.	.	.	0.0000	0.0000	(3.44E-02 Mg/yr)
WATER	1.04E+02	1.	.	.	0.0000	0.0000	(3.27E+03 Mg/yr)
XYLENE	3.32E-03	.75839	.	.2416	0.0000	0.0000	(1.05E-01 Mg/yr)
TETRADECANE	1.01E-04	.00215	.	.9978	0.0000	0.0000	(3.17E-03 Mg/yr)
DODECANE (C12 linear)	6.75E-04	.02475	.	.9752	0.0000	0.0000	(2.13E-02 Mg/yr)
UNDECANE (C11 linear)	2.03E-03	.08323	.	.9168	0.0000	0.0000	(6.41E-02 Mg/yr)
DECANE (C10 linear)	5.36E-03	.22819	.	.7718	0.0000	0.0000	(1.69E-01 Mg/yr)
ISOPENTANE	5.36E-03	1.	.	.	0.0000	0.0000	(1.69E-01 Mg/yr)
ISOBUTANE	1.67E-03	1.	.	.	0.0000	0.0000	(5.26E-02 Mg/yr)
NONANE C9H20	3.18E-02	.52462	.	.4754	0.0000	0.0000	(1.00E+00 Mg/yr)
CARBON DIOXIDE	4.30E-04	1.	.	.	0.0000	0.0000	(1.36E-02 Mg/yr)

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TRIDECANE (C13 linear)	3.16E-04	.00928	.	.9907	0.0000	0.0000	(9.98E-03 Mg/yr)
PENTADECANE (C15 linear)	3.70E-05	.00057	.	.9994	0.0000	0.0000	(1.17E-03 Mg/yr)
HEPTADECANE (C17 linear)	0.00E+00	.	.	1.	0.0000	0.0000	(0.00E+00 Mg/yr)
OCTADECANE (C18 linear)	0.00E+00	.	.	1.	0.0000	0.0000	(0.00E+00 Mg/yr)
NONADECANE (C19 linear)	0.00E+00	.	.	1.	0.0000	0.0000	(0.00E+00 Mg/yr)
EICOSCANE (C20 linear)	0.00E+00	.	.	1.	0.0000	0.0000	(0.00E+00 Mg/yr)

TOTAL ALL COMPOUNDS 1.04E+02 g/s air emissions
TOTAL ALL COMPOUNDS 3.28E+03 Mg/yr air emissions

Wastewater Collection and Treatment Units

File View Screen Display Units Waste Help notes Return

EICOSCANE (C20 linear)

Shift waste | Insert row | HELP
Delete the compound
Return from waste edit

.1048622

All compound concentrations in ppm	waste 1	waste 2	waste 3	waste 4	waste 5	waste
flow (l/s)	.1048622					
code						
drop (cm)						
radius (cm)						
BENZENE	13					
BUTANE	43.8					
ETHANE	9.3					
ETHYLBENZENE	12.3					
HEPTANE(-n)	411.9					
HEXADECANE N	783.6837					
HEXANE(-n)	158.8					
HYDROGEN SULFIDE						
METHANE	16.6					
OCTANE	936.5					
PENTANE	56.4					
PROPANE	26					
TOLUENE	29.1					
TRIMETHYLPENTANE 2,2,4	10.4					
WATER	990000					
XYLENE	41.8					
TETRADECANE	445.7139					
DODECANE (C12 linear)	260.1272					
UNDECANE (C11 linear)	232.8625					
DECANE (C10 linear)	223.809					
ISOPENTANE	51.1					
ISOBUTANE	15.9					
NONANE C9H20	577.72					
CARBON DIOXIDE	4.1					
TRIDECANE (C13 linear)	325.085					
PENTADECANE (C15 linear)	615.3324					
HEPTADECANE (C17 linear)	873.967					
OCTADECANE (C18 linear)	837.2531					
NONADECANE (C19 linear)	694.001					
EICOSCANE (C20 linear)	23.02					

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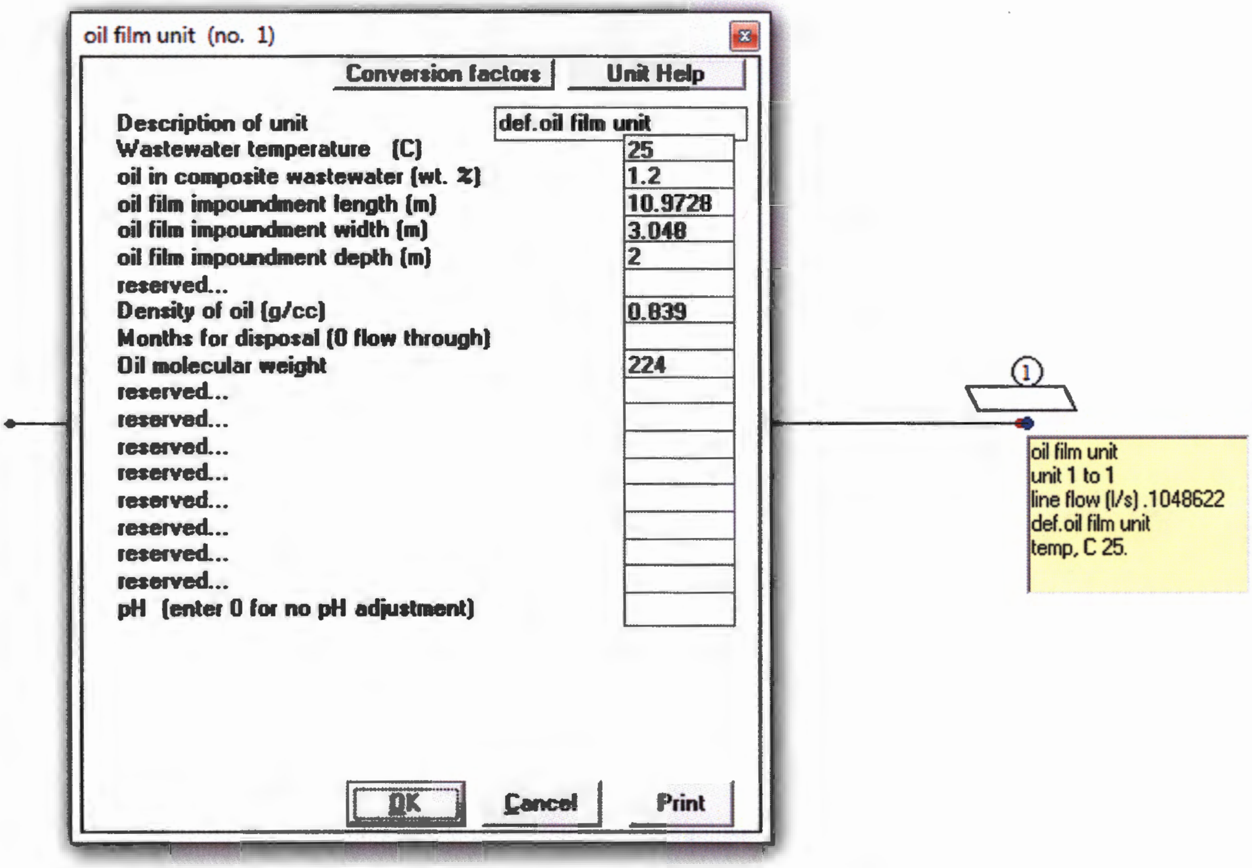
sheet 1 | sheet 2 | sheet 3 | sheet 4 | sheet 5 | sheet 6 | sheet 7

divert flow from 1 | Divert 1 to waste


oil film unit (no. 1)

Conversion factors | Unit Help

Description of unit	def.oil film unit
Wastewater temperature (C)	25
oil in composite wastewater (wt. %)	1.2
oil film impoundment length (m)	10.9728
oil film impoundment width (m)	3.048
oil film impoundment depth (m)	2
reserved...	
Density of oil (g/cc)	0.839
Months for disposal (0 flow through)	
Oil molecular weight	224
reserved...	
reserved...	
reserved...	
reserved...	
reserved...	
reserved...	
reserved...	
reserved...	
pH (enter 0 for no pH adjustment)	

OK | Cancel | Print

POTENTIAL-TO-EMIT SUMMARY

Marathon Oil

Steamboat Butte C1 and C3 Tank Batteries
Potential to Emit Summary (tpy)

Facility	ID	Unit	Throughput / Rating		NO_X	CO	VOC	n-C_6	Benzene	Toluene	Ethyl Benzene	Xylenes	SO_2	H_2S	CO_2	CH_4	N_2O	CO_{2e}	HAPS/ BTEX
C-3	SBC3B-500/501	Water Tank Vents	2400	bpd	---	---	0.67	0.04	0.00	0.00	0.00	0.00	---	0.30	1.56	0.36	0.00	9.04	0.04
	SBC3B-320	Cement Tank	400	bbl/wk	---	---	7.93	0.58	0.05	0.11	0.04	0.12	---	---	0.01	0.06	---	1.28	0.89
	SBC3B-FUG	Fugitives	8760	hr/yr	---	---	NA	0.01	0.00	0.00	0.00	0.00	---	0.03	0.11	0.15	---	3.26	0.01
Facility SubTotal					*0.00*	*0.00*	*8.61*	*0.62*	*0.05*	*0.11*	*0.04*	*0.12*	*0.00*	*0.33*	*1.69*	*0.57*	*0.00*	*13.58*	*0.94*
C-1	SBC1B-305	1MMBtu Gas Fired Treater	8760	hr/yr	0.43	0.36	1.30	0.02	0.00	0.01	0.00	0.01	0.00	0.00	535.73	2.35	0.01	588.02	0.04
	SBC1B-306	1MMBtu Gas Fired Treater	8760	hr/yr	0.43	0.36	1.30	0.02	0.00	0.01	0.00	0.01	0.00	0.00	535.73	2.35	0.01	588.02	0.04
	SBC1B-307	2MMBtu Gas Fired Treater	8760	hr/yr	0.86	0.72	2.61	0.03	0.00	0.01	0.00	0.03	0.01	0.00	1071.45	4.70	0.02	1176.04	0.08
	SBC1B-510	Production Flare	183733	scfd	3.24	17.65	30.61	0.45	0.04	0.05	0.01	0.16	189.40	3.87	7164.40	10.93	0.01	7397.23	0.72
	SBC1B-511	Oil Tank Flare	17000	scfd	0.30	1.63	2.83	0.04	0.00	0.00	0.00	0.02	17.93	0.19	662.89	1.01	0.00	684.13	0.07
	SBC1B-507/508	Water Tank Vents	68000	bpd	---	---	19.04	1.01	0.10	0.07	0.00	0.00	---	8.60	44.28	10.09	---	256.27	1.19
	SBC1B-FUG	Fugitives	8760	hr/yr	---	---	NA	0.02	0.00	0.00	0.00	0.00	---	0.09	0.33	0.46	---	10.05	0.02
Facility SubTotal					*5.26*	*20.73*	*57.70*	*1.58*	*0.16*	*0.15*	*0.02*	*0.24*	*207.34*	*12.74*	*10014.81*	*31.90*	*0.05*	*10699.77*	*2.16*
Operations Total					**5.26**	**20.73**	**66.31**	**2.20**	**0.21**	**0.26**	**0.07**	**0.36**	**207.34**	**13.07**	**10016.49**	**32.47**	**0.05**	**10713.36**	**3.10**

ACTUAL EMISSIONS SUMMARY

Marathon Oil

Steamboat Butte C1 and C3 Tank Batteries
2011 Actual Emissions
(tpy)

Facility	ID	Unit	Throughput / Rating		2011 Actual Throughput		NO_X	CO	VOC	n-C_6	Benzene	Toluene	Ethyl Benzene	Xylenes	SO_2	H_2S	CO_2	CH_4	N_2O	CO_{2e}	HAPS/ BTEX
C-3	SBC3B-500/501	Water Tank Vents	2400	bpd	1837	bpd	---	---	0.51	0.03	0.00	0.00	0.00	0.00	---	0.23	1.20	0.27	0.00	6.92	0.03
	SBC3B-320	Cement Tank	400	bbl/wk			---	---	7.93	0.58	0.05	0.11	0.04	0.12	---	---	0.01	0.06	---	1.28	0.89
	SBC3B-FUG	Fugitives	8760	hr/yr			---	---	NA	0.01	0.00	0.00	0.00	0.00	---	0.03	0.11	0.15	---	3.26	0.01
Facility SubTotal							*0.00*	*0.00*	*8.45*	*0.61*	*0.05*	*0.11*	*0.04*	*0.12*	*0.00*	*0.26*	*1.32*	*0.48*	*0.00*	*11.46*	*0.93*
C-1	SBC1B-305	Gas Fired Treater	8760	hr/yr	8760	hr/yr	0.43	0.36	2.81	0.02	0.00	0.01	0.00	0.01	17.74	0.00	511.97	0.01	0.00	512.47	0.04
	SBC1B-306	Gas Fired Treater	8760	hr/yr	0	hr/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	SBC1B-510	Production Flare	183733	scfd	112000	scfd	1.98	10.76	18.66	0.27	0.03	0.03	0.01	0.10	115.45	2.36	4367.29	6.66	0.01	4509.22	0.44
	SBC1B-511	Oil Tank Flare	17000	scfd	5000	scfd	0.09	0.48	0.83	0.01	0.00	0.00	0.00	0.00	5.27	0.06	194.97	0.30	0.00	201.22	0.02
	SBC1B-507/508	Water Tank Vents	68000	bpd	53139	bpd	---	---	14.88	0.79	0.08	0.06	0.00	0.00	---	6.72	34.60	7.89	---	200.26	0.93
	SBC1B-FUG	Fugitives	8760	hr/yr			---	---	NA	0.02	0.00	0.00	0.00	0.00	---	0.09	0.33	0.46	---	10.05	0.02
Facility SubTotal							*2.50*	*11.60*	*37.18*	*1.11*	*0.11*	*0.10*	*0.01*	*0.12*	*138.47*	*9.22*	*5109.16*	*15.32*	*0.01*	*5433.22*	*1.45*
Operations Total							**2.50**	**11.60**	**45.63**	**1.72**	**0.16**	**0.21**	**0.06**	**0.24**	**138.47**	**9.48**	**5110.48**	**15.81**	**0.01**	**5444.68**	**2.38**